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A NEW SUBSTITUTE METHOD FOR TRANSPORTATION PROBLEM

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ABSTRACT

In this paper we introduced the new substitute Method to solve the transportation problem and get the solution which is similar to the optimum solution. The aim of this paper is to design the new substitute method to solve the transportation problem in an easy way. In paper firstly we describe the transportation problem with their different existing method also with the optimality test applied on the problem called MODI method. After that we introduced the new substitute method's algorithm and numerical example solved by the new substitute method.

KEYWORDS: Optimality, Initial Feasible Solution, North –West Corner Method, Lowest Cost Entry Method, Vogel's Approximation Method

1.1 INTRODUCTION

The transportation problem is a basic network problem. Many scholars have defined an extended basic transportation problem that include the determination of optimum transportation patterns. The basic need of transportation problem is to minimize the cost of shipping goods form various origins to different destination so that, the cost remains minimized on every arrival of the goods according to the capacity.

Hitchcock [8] the basic transportation problem is developed by Hitchcock in 1941 and **Koopmans [9]** further advanced it independently. The relationship between basic solutions in the transport problem and the tree structure of a graph introduced by **Koopmans [9]** the basic transportation problem developed by Hitchcock; however it is solved for the business purpose 1951. To solve transportation problems **Dantzig[3]** choose the simplex method.The formulation of T. P. and the simplex method is applied to solve the problem by **Dantzig[3].** Since transportation problem is a special type of problem which is an integral part of operation research and this topic is in almost all the books of operation research and mathematical programming. An intuitive presentation was developed by **Charnes and Cooper [2]** which is on Dantzig's procedure. On the other hand there are various results found from **these Grigoriadis and Walker [7] , Ford and Fulkerson [4], Balinski and Gomory [1], Muller Merbach [10],. Gass [5]** presented briefly and in (1990) the issue of transportation problem is elaborated in detail and there are different methodologies related to transportation problem as there are different method for solving the transportation problem by which different solution obtained**.**

1.2 Problem and Formulation:

In this section we introduce a general transportation problem which solved by the regular solution methods of transportation as Vogel's Approximation Method.

Example 1

A company has three production facilities S_1, S_2& S_3 with production capacity of 7,9 & 18 units (in 100s) per week of a product ,respectively. These units are to be shipped to four warehouses D_1, D_2, D_3 & D_4 with requirement of 5, 6,

7 & 14 units (in 100s) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouse are given in the table below;

Table 1

	D_1	D_2	D_3	D_4	Capacity
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demands	5	8	7	14	34

Solution: Using Vogle's Approximation method we find the total transportation cost is

Table 2

	D_1	D_2	D_3	D_4	Capacity
S_1	19(5)	30	50	10(2)	7
S_2	70	30	40(7)	60(2)	9
S_3	40	8(8)	70	20(10)	18
Demands	5	8	7	14	34

=19*5+8*8+2*10+2*60+10*20+7*40

=95+64+20+120+200+280

=Rs.779

NOW WE FIND OPTIMAL SOLUTION USING MODI METHODS

After obtaining the initial basic feasible solution we have to find the optimum solution, for this we will check optimality for the given solution. With $m+n-1$ allocation in independent position with transportation cost of Rs 779 obtained (by Vogel's approximation method). This improved basic feasible solution is given in table.

Table 3

	D_1	D_2	D_3	D_4	Capacity
S_1	19(5)			10(2)	7
S_2		30(2)	40(7)		9
S_3		8(6)		20(12)	18
Demands	5	8	7	14	

The cost for this solution becomes

=19(5) + 10(2) + 30(2) + 40(7) + 8(6) + 20(12)

= Rs.743

The above solution Rs.743 is optimum.

1.3 ALGORITHM FOR NEW SUBSTITUTE METHODS

Step 1-Choose the least value from the demand and capacity of the transportation table.

Step 2-Allocate the minimum value of demand/ capacity to the cell having lowest element.

Step 3- Subtract the allocated value of demand/capacity from the adjacent demand/capacity value and table is adjusted.

Step 4- The column or row having allocated cell adjacent to the allocated demand/capacity is cross-out from the transportation table and the demand/capacity is exhausted.

Step 5-Prepare the new transportation table.

Step 6- Similar process is repeated to get the total transportation cost which is minimized.

Now the final total transportation cost is

Table 4

	D_1	D_2	D_3	D_4	Capacity
S_1	19(5)	30	50	10(2)	7
S_2	70	30(2)	40(7)	60	9
S_3	40	8(6)	70	20(12)	18
Demands	5	8	7	14	34

=19(5) +10(2) +40(7) +30(2) +8(6) +20(12) =Rs.743

This is similar to the optimum cost of the transportation problem after using the substitutive method.

CONCLUSIONS

The substitute Method is convenient in use and as it help us to get the solution more nearer to the optimum solution.The requirement of optimization of the transportation cost ,or the optimum solution for the problem is achieved by the substitute Method.

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